

## **PROBING NANOSCALE STRUCTURES USING SANS - FALL 2016**

**Instructor:** Dr Boualem Hammouda  
National Institute of Standards and Technology  
Center for Neutron Research  
(301) 975-3961 voice (301) 921-9847 FAX  
e-mail: [hammouda@nist.gov](mailto:hammouda@nist.gov)

This is a **3-credit hour graduate level distance learning course** offered online. Students interested in taking this course for credit should make arrangements with their advisors and register for a special topics course at their university.

Course **material will be posted online on a weekly basis**. This includes pdf files as well as mp4 (audiovisual) recordings. **Weekly homeworks (due on Saturdays at 11:00 pm)** will be corrected and returned. Midterm and final exams will be administered online. Weekly **live discussion sessions** will also be offered.

This course covers various aspects of **Small-Angle Neutron Scattering** (SANS) as applied to probing nanoscale structures. This includes polymers, complex fluids, some biology and materials science. This course contains theoretical and experimental aspects, as well as representative data interpretation methods. Students learn about a characterization method in high demand from a scientist who is a staff member of one of the leading neutron scattering facilities in the nation (the **National Institute of Standards and Technology** Center for Neutron Research).

**Main Text available online:** **Recently revised** and updated SANS toolbox available at [http://www.ncnr.nist.gov/staff/hammouda/the\\_SANS\\_toolbox.pdf](http://www.ncnr.nist.gov/staff/hammouda/the_SANS_toolbox.pdf)

### **Grading:**

- 10 weekly Homeworks (50%)
- Midterm (20%)
- Final exam (30%)

At the end of the semester, scores for the 10 homeworks and the grades for the midterm and final exams will be sent to the advisor.

### **Topics Covered**

- Neutron Sources and Neutron Flux
- Neutron Scattering
- SANS Technique and Instrumentation
- Simple SANS Data Interpretation
- SANS Data Modeling
- SANS from Polymers
- SANS from Complex Fluids
- SANS in Biology
- SANS in Materials Science
- Even Lower SANS Scales